Biological Evaluation/Biological Assessment
for
Threatened, Endangered, and Sensitive (TES) Species

Whitetop Spruce Restoration

George Washington and Jefferson National Forests
Mount Rogers National Recreation Area

Smyth, Grayson, and Washington Counties, Virginia

1.Introduction

Forest Service Manual (FSM) Section 2672.41 requires a biological evaluation (BE) and/or biological assessment (BA) for all Forest Service planned, funded, executed, or permitted programs and activities. The objectives of this BE/BA are to: 1) ensure that Forest Service actions do not contribute to loss of viability of any native or desired non-native species or contribute to trends toward federal listing, 2) comply with the requirements of the Endangered Species Act (ESA) so that federal agencies do not jeopardize or adversely modify critical habitat (as defined in ESA) of federally listed species, and 3) provide a process and standard to ensure that threatened, endangered, proposed, and sensitive species receive full consideration in the decision-making process using the best available science.

The Mount Rogers National Recreation Area supports known occurrences and suitable habitat for several TES species, all of which were considered in this analysis. This BE/BA documents the analysis of potential effects of the proposed project to TES species and associated habitat. It also serves as biological input into the environmental analysis for project-level decision making to ensure compliance with the ESA, National Environmental Policy Act (NEPA), and National Forest Management Act (NFMA).

Affected Area

The proposed project is located in Smyth, Grayson, and Washington Counties, VA. It reaches from the peak of Whitetop Mountain at 5,560 ft down to approximately 4,000 ft in elevation except for the Upper Helton drainage where the project boundary extends below 4,000 ft due to known spruce locations being below that elevation. Please see maps 1 and 2 for a more detail on the project boundary. Primary natural community types within the project area include Southern Appalachian Spruce forest, Southern Appalachian Northern hardwood forest, high elevation acidic cover forest, and Southern Appalachian grassy bald. This area comprises one of the most diverse assemblages of flora and fauna in the state of Virginia (USDA, 2004). Open area prescribed fire, road maintenance, trail maintenance, and activities associated with grazing are currently the only management actions taking place within the proposed project area.

Figure 1. Whitetop Spruce Restoration Boundary. Topographic Map.

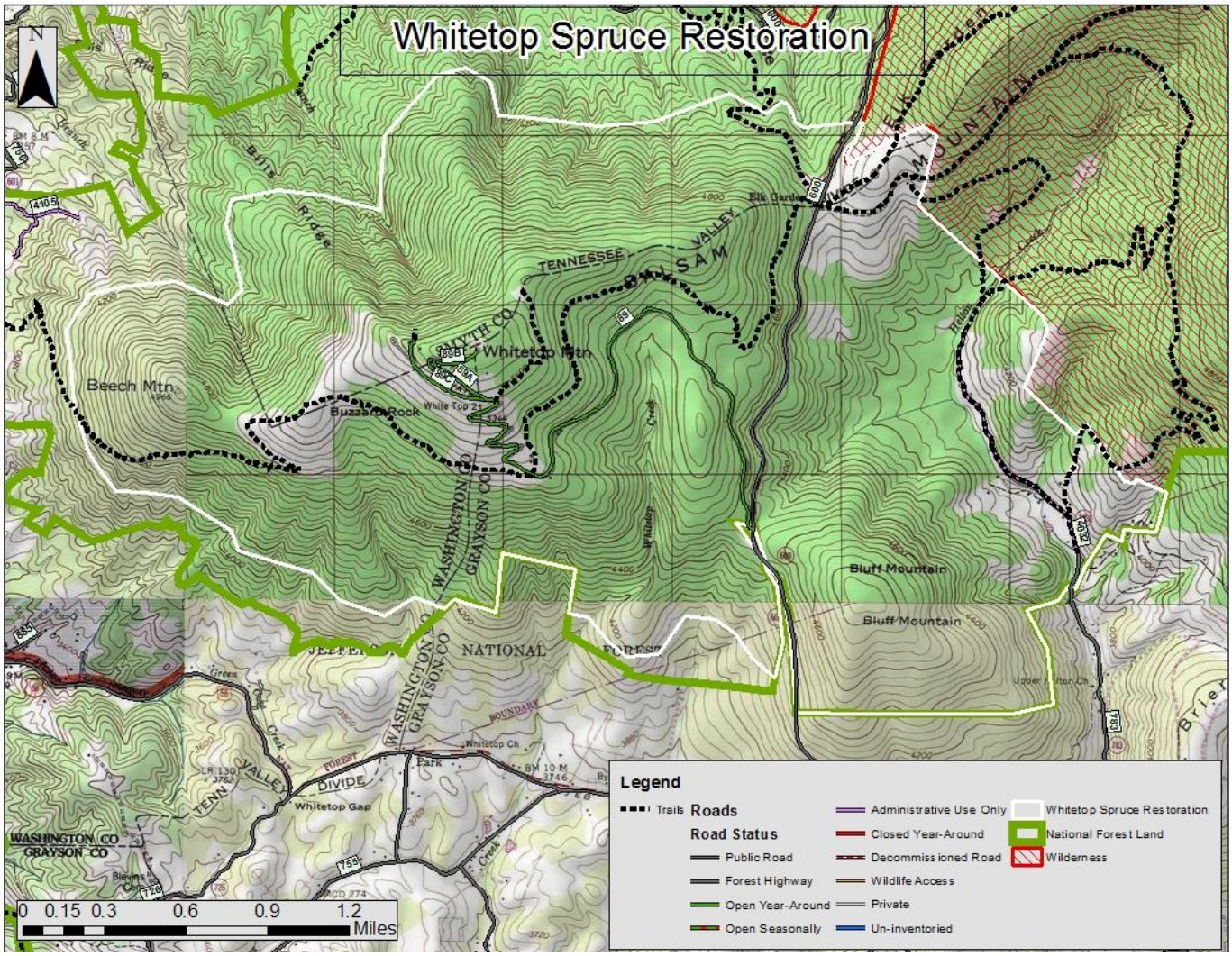
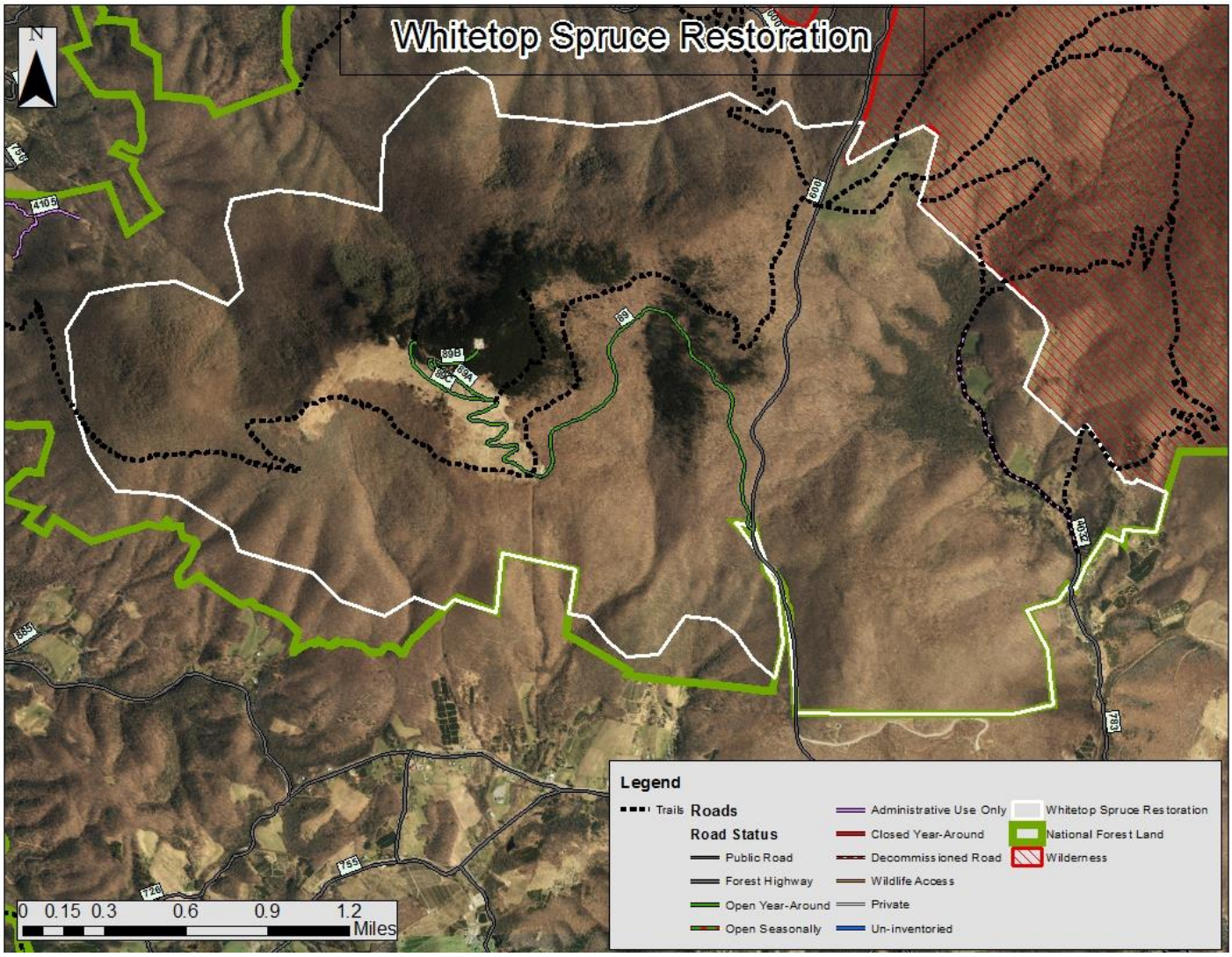


Figure 2. Whitetop Spruce Restoration Boundary. Aerial Imagery.



Purpose and Need

The purpose of the project is to increase habitat connectivity between the isolated spruce forest pockets on Whitetop by selectively girdling and felling northern hardwood trees in direct competition for sunlight with midstory and understory spruce. In locations where no advanced regeneration is present, the reintroduction of spruce for habitat connectivity will require planting transplanted and nursery seedlings. Releasing these spruce trees would encourage spruce into the overstory and improve cone production. This will ensure an increase in advanced regeneration of spruce and increase the size of spruce patches where they exist. The Revised Land and Resource Management Plan (Forest Plan) for the Jefferson National Forest outlines the management goals for the Mount Rogers National Recreation Area. This project is in line with the objectives of the forest plan. Whitetop Mountain is identified in the forest plan as a special area with an objective of restoring 900 acres of the montane spruce-fir forest community (USDA, 2004). Spruce and spruce-northern hardwood habitats are vital for the survival of many rare and federally listed species endemic to these habitats include the Carolina

Northern Flying Squirrel, spruce-fire moss spider, Northern saw-whet owl, Weller's salamander, Northern pygmy salamander, and rock gnome lichen.

Proposed Action

The forest service is proposing to restore spruce within the Whitetop project area by implementing the following actions:

- Release red spruce in the mid-story and understory by girdling and felling northern hardwood trees that fall within the vertical cylinder (10-15ft) projected above targeted release trees. More information about methodology can be found published in the Natural Areas Journal titled Release of Suppressed Red Spruce Using Canopy Gap Creation – Ecological Restoration in the Central Appalachians which can be found at the link below. https://www.fs.fed.us/nrs/pubs/jrnl/2016/nrs_2016_rentch_001.pdf
- Improve spruce stand resiliency by stratifying existing single aged spruce stands with canopy gaps. Gap creation would involve girdling 2-5 mature spruce trees per acre targeting unhealthy spruce when present.
- Planting red spruce seedlings in suitable sites currently absent of spruce. Seedlings will be acquired through either nursery stock grown from Whitetop spruce cones or by transplanting seedlings from within the project area. Once established, seedlings would be released through girdling and brush cutting as needed.

These activities would take place gradually as funds and labor become available. It is expected that it would take over 10 years to treat all the currently suitable restoration sites within the project area boundary, and new treatment areas would emerge down the road as initial treatments start to show success. The project area boundary shown in figures 1 and 2 was designed to incorporate all potential spruce restoration sites outside wilderness areas, those that are known and unknown. All acres within the boundary are not planned for treatment, only those that are deemed suitable for spruce restoration.

Minimization Measures

Due to the sensitivity and rarity of the flora/fauna located in the project area, coordination measures are needed to protect federally listed and forest sensitive species. Also, coordination measures are needed to reduce impacts to other resource areas. Coordination measures include:

- Chainsaw activities will not take place March 15thst – August 31st to avoid impacts to Carolina Northern Flying Squirrel during the breeding season.
- Girdling, planting, and seedling planting/transfer sites will be surveyed for rare plants during the growing season prior to implementation. If federally listed plants are found at these locations, individuals will be buffered from impacts to ensure protection. Mitigation

measures for sensitive plant species will be evaluated on a case by case basis to ensure that project activities do not cause a trend towards federal listing.

- Archeology will be consulted on planting/transplanting sites prior to implementation to ensure no archeological sites are disturbed during implementation
- No girdling will take place within 100 feet of rock gnome lichen locations
- Hardwoods ≤ 8 inches DBH may be felled if needed
- Yellow birch trees greater than 8 inches in diameter are to be favored as leave trees because they are important potential den trees and provide nesting material for Carolina Northern Flying Squirrels
- Trees with cavities and dreys are to be designated as leave trees for Carolina Northern Flying Squirrel den sites.
- Trees within 50 feet of the trails or roads are not to be girdled to avoid potential impacts to forest users, trees ≤ 8 inches may be felled within this buffer zone
- Shaded, moist rock outcrops with bryophytes that currently provide suitable habitat for spruce-fire moss spider would receive a 100 foot buffer to protect habitat for this species.

Consultation History

A meeting between USFS, ATC, and USFWS was conducted on 03/23/2020 to cooperatively develop the proposed action and coordination measures needed to protect federally proposed, threatened, and endangered species.

2. Species considered

OAR Step Down Process

A "step down" process was followed to eliminate species from further analysis and focus on those species that may be affected by proposed project activities. Species not eliminated are then analyzed in greater detail. Results of this step-down analysis process are displayed in the Occurrence Analysis Results (OAR) column of the table in Appendix A. First, the range of a species was considered. Species' ranges on the Forest are based on county records contained in such documents as the "Atlas of the Virginia Flora," but are further refined when additional information is available, such as more recent occurrences documented in scientific literature or in Natural Heritage databases. Many times, range information clearly indicates a species will not occur in the project area due to the restricted geographic distribution of most TES species. When the project area is outside a known species range, that species is eliminated from further consideration by being coded as OAR code "1" in the Appendix A table.

From past field surveys and knowledge of the area, and given the proposed action, those species which are analyzed and discussed further in this document are those that: a) are found to be located in the activity areas (OAR code "5"); b) were not seen during the survey(s), but possibly occur in the activity areas based on habitat observed during the survey(s) or field survey was not conducted when species is recognizable (OAR code "6"); c) for aquatic species, they are known or suspected

downstream of project or activity areas and within identified geographic bounds of water resource cumulative effects analysis area (OAR code "8") and d) federally listed mussel and/or fish species known in 6th level watershed of project areas. Conservation measures from USFWS/FS Conservation Plan applied (OAR code "9").

A total of 14 species were identified by USFWS in IPAC at having potential to be in the project area. However since the IPAC species is generated using county lines and/or buffers some these species either do not have habitat in the project area or are located in a different watershed. These species will not be impacted by this project and will receive a no effect determination. More information on those species can be found in the determination table and species affected tables in the main body of this document. Federally proposed, threatened, and endangered species are analyzed in a separate biological assessment for this project please see that document for further analysis on those species. The following sensitive species are known or suspected to occur in or near the area or are potentially impacted by the proposed action and are coded OAR Code 6 or 9:

Table 1. Sensitive species identified by the OAR step down process as needing further analysis

Common Name	Scientific Name	Species Type
Northern Pigmy Salamander	*Desmognathus organi*	Salamander
Weller's Salamander	*Plethodon welleri*	Salamander
Eastern Smallfooted Bat	*Myotis leivii*	Mammal
Tricolored Bat	*Perimyotis subflavus*	Mammal
Highland Slitmouth	*Stenotrema altispira*	Snail
Montane Centipede	*Escaryus cryptorobius*	Centipede
Whitetop Mountain Centipede	*Escaryus orestes*	Centipede
Monarch	*Danaus plexippus*	Butterfly
Witch's-hair lichen	*Alectoria fallacina*	Lichen
Appalachian Shield Lichen	*Heterodermia appalachensis*	Lichen
A Foliose Lichen	*Heterodermia erecta*	Lichen
A Foliose Lichen	*Hypotrachyna oostingii*	Lichen
Virginia Hypotrachyna	*Hypotrachyna virginica*	Lichen
A Lichen	*Lecanora masana*	Lichen
A Liverwort	*Bazzania mnudicaulis*	Liverwort
A Liverwort	*Plagiochila corniculata*	Liverwort
A Liverwort	*Plagiochila sallivantii var. sallivantii*	Liverwort
A Liverwort	*Redula tenax*	Liverwort
A Liverwort	*Sphenlobopsis pearsonli*	Liverwort
Northeastern Peatmoss	*Sphagnum flavicomans*	Moss
Fraser Fir	*Abies fraseri*	Vascular Plant
Mountain bittercress	*Cardamine clematis*	Vascular Plant

3. Effects of the proposed action on sensitive species

Northern Pygmy Salamander

The northern pygmy salamander (NPS) occupies a small rage above 3600 ft in elevation specifically in the Appalachian mountains of Virginia, North Carolina and Tennessee. Unlike many salamander species, the northern pygmy salamander appears more stable with healthy populations in spruce-fir forest habitats (NatureServe2020). Throughout the forest, this species avoids saturated soils in preference for higher and drier areas under moss, leaf litter, logs, bark on stumps, or rocks. However, they can be found near headwater streams when the females are depositing and guarding their eggs. Being mostly terrestrial, these amphibians prey on soil mites, springtails, moths, beetles, flies, pseudoscorpions, thrips, and spiders.

https://www.tn.gov/twra/wildlife/amphibians/salamanders/pygmy.htmlFurthermore, with the increased activities of logging, recreational development and acid rain,there have been a loss of forest habitats that usually sustain the species.

Weller's Salamander

Historically Weller's salamanders inhabit high elevation regions (usually above 4500 ft, but occasionally are found at lower elevation about 2300 ft. For example one can spot them at the Mt. Rogers and Whitetop Mountain areas of southwestern Virginia along the Unaka Mountain ridges to areas in extreme northeastern Tennessee (Johnson and Unicoi counties) and northeastern North Carolina (Yancey County), including Grandfather Mountain, North Carolina. These populations are all associated with the Blue Ridge Physiographic Province even though these populations are currently scattered and appear to be relocating from a previously more widespread distribution. According to USFWS, the die-off of spruce-fir forests in the southern Appalachians constitutes the most obvious threat to populations of Weller's salamanders and thus reflects its endangered status. Despite its vulnerable habitat, Weller’s salamander can be found beneath logs, stones, and flakes of rock (course talus) in spruce-fir forests covering high slopes above 1,524 m (5,000 ft). Like other salamanders, weller’s salamander is reported sharing the same habitat as the following salamanders: Blue Ridge two-lined salamanders, Blue Ridge dusky salamanders and pygmy salamanders red-backed salamanders northern gray-cheeked salamanders, southern ravine salamanders. (AmphibiaWed 2020)

Effects to these species will be discussed together because effects would be similar.

Direct, Indirect, and Cumulative Effects

Direct effects would be minimal for these species. Trees over 8 inches will be girdled not affecting these species. Individuals in transplanting and planting areas are may be crushed, but it is more likely that these individuals will seek refuge under rocks and logs when work is taking place. Indirect effects would be beneficial for both species. Girdle trees would eventually fall creating more favorable habitat conditions for species. Implementing this project would increase

spruce habitat in the project are in turn creating more habitat for these species. There are no known past, current, and future actions that would be cumulative with this project.

There are no cumulative effects expected with this project.

Determination of Effects

This project **may impact individuals** but is **not likely to cause a trend towards federal listing** for northern pygmy salamander or Weller's salamander. While a few individuals may be directly impacted, indirect effects would improve habitat for these species.

Eastern Small-footed Bat

Introduction

The eastern small-footed bat (ESFB) is known or likely to occur in 32 Virginia counties and ranges from New England south to northern Georgia and west to Oklahoma. During the winter this bat species hibernates in caves. During the late spring, summer, and early fall ESFB forage at night in forest and open woodland habitat, usually along ridge crests, and roost during the day in crevices of large rock outcrops and cliffs. ESFBs are potentially present and roosting during summer months wherever large rock outcrops or cliffs are present (USDA, 2014). There are no known caves with the microclimate suitable for bat winter hibernation located within the NSM project area.

The most serious threat to bats in eastern North America is white-nose syndrome (WNS), an often (but not always) lethal condition caused by a fungal pathogen that attacks hibernating bats. WNS has spread rapidly and now has been documented throughout the range of ESFB, and can affect this species (NatureServe, 2020). However, USFWS (2013) reviewed available information on population trends and WNS effects on small-footed bats and concluded that WNS does not appear to have caused significant population declines in hibernating ESFB.

Direct, Indirect and Cumulative Effects

There would be little to no direct effects for this species. This species primarily roosts in rock outcropings and cave neither of which would be directly impacted by this project.

Determination of Effects

Considering the information listed above, eastern small-footed bats may occur in the project area, and foraging habitat would be positively affected in the short-term, the determination of effect for this species for the proposed actions is, ***"may impact individuals but not likely to cause a trend to federal listing or a loss of viability".***

Tricolored Bat

Introduction

Effects to tricolored bats were considered in this BE because this area is likely to support occurrences of the tricolored bat and habitat features found in the project area could be utilized by this species. Tricolored bats have a widespread range across the eastern United States and southeastern Canada, south into Central America, extending west into the central Great Plains. This species is a small bat, reaching 3½ inches in length and has a wingspan of just over 9 inches. The fur color is variable, but typically is a reddish brown to yellowish brown, slightly lighter on the belly. Its back fur is unique being tricolored -- gray at the base, tan in the middle, and dark-tipped. The wing membranes are blackish, but the skin covering the larger wing bones, including the forearm, is flesh colored (NatureServe 2020).

Tricolored bats will hibernate in a variety of sites including mines, rock shelters, and quarries, but they use caves most frequently. They are typically found hanging singly from the ceiling or along a wall. The bats prefer relatively warmer and more humid portions of caves for hibernation. They often have water droplets condensed on their fur that can make them sometimes appear white when a light is shined on them (VDGIF, 2019a).

Although most summer roosting sites are unknown in Virginia or West Virginia, this species has been observed roosting in high tree foliage, often in clumps of dead leaves or needles, in tree crevices and cavities, and human constructed structures such as buildings, homes, barns, sheds and bridges. Males likely roost in trees and/or manmade structures during summer. (VDGIF 2019a, NatureServe 2020). At maternity colonies, one to two pups are born to each female during June. There are currently no known maternity colony or roosting sites in Virginia (see Appendix B – Tricolored Bat Winter Habitat & Roosts Application map, DGIF 2019b).

Tricolored bats are insectivores that feed almost entirely on small flying insects they capture along woodland edges, as well as along waterways and riparian areas, near forested habitat (NatureServe 2020). They forage in relatively small areas, at treetop level, usually over watercourses, and they are never found in deep woods or open fields unless large trees are nearby (VDGIF, 2019a). Suitable habitat for tricolored bat is known to occur on all GWJNF Districts and counties, and can be assumed to occur within the NSM project working areas.

Once one of our most common bat species, tricolored bats have experienced substantial declines across Virginia and West Virginia, since the discovery of white-nosed syndrome (WNS) in 2009. This bat occurred commonly across GWJNF area in summer and during migration (NatureServe, 2020) before these population declines (pers com. Rick Reynolds DGIF). A few years ago, the population impact of WNS on tricolored bats appeared to be less severe than it was initially, but recent data indicates that a drastic decline has occurred, and the disease continues to spread across a substantial portion of the bat's range (NatureServe, 2020). In Virginia, winter hibernacula

monitoring surveys have documented a more than 95% decline across the State. Tricolored bat is now State listed as Endangered (VDGIF 2019a; VDGIF 2019c). The proposed project area is outside of known high priority hibernacula and roost sites for tricolored bats in Virginia (VDGIF 2019b). There were no tricolored bats seen during field visits and the closest known hibernaculum to project working areas is over 20 miles away near Staunton Dam (VDGIF 2019b).

Direct, Indirect, and Cumulative Effects

There would be minimal if any direct effects to this species. Trees over 8 inches would be girdled leaving those trees that are suitable roosts trees standing and usable. Noisy activities such as chainsaw girdling would not be conducted in the summer months reducing potential noise disturbance to this species during the majority of breeding season. Indirect effects are expected to be beneficial because girdling hardwood trees would turn these trees into snags creating additional potential roost trees for this species.

There would be no cumulative effects as a result of implementing the proposed action. Other activities in the action area such as trail maintenance, grazing, and open area prescribed fire are would not impact montane spruce habitat or spruce/ northern hardwood habitat.

Determination of Effects

Implementing this propose action may impact individuals but is **not likely to cause a trend towards federal listing** of this species because implementation would create more roost trees for this species and incorporating minimization measures into the project reduces impacts to this species.

Highland Slitmouth

Introduction

Found in the higher elevations of TN, NC, and VA mixed cove and northern hardwood forests under leaf litter. This species is often found crawling on herbaceous vegetation in wet weather. There are no known records of this species in VA (NatureServe 2020).

Direct, Indirect, and Cumulative Effects

This project would have minimal direct effects on this species. Girdling would have no direct effects to this species. Since girdling would only be directly over spruce seedlings and midstory trees micro habitat is not likely to be altered. Planting and transplants could damage individuals that may be present underground, but individuals are more likely to be under moist logs where trees wouldn't be planted. Indirect effects would reduce some habitat in the long term. This species prefers northern hardwood habitats and implementing this project would restore spruce habitat to areas that are currently dominated by northern hardwoods. While northern hardwood habitat would be reduced there would still be plenty of northern hardwood habitat available in the project area for this species to thrive. There would be no past, present, or future actions that would be cumulative with this project

Determination of Effects

Implementing this propose action may impact individuals but is **not likely to cause a trend towards federal listing** of this species because implementation would create more roost trees for this species and incorporating minimization measures into the project reduces impacts to this species.

Montane Centipede

Introduction

This species is only known in southwest Virginia and inhabits mixed spruce/northern hardwood stands. There are no recent records of this species (NatureServe2020).

Whitetop Mountain Centipede

Introduction

This species is only known in southwest Virginia and inhabits mixed spruce/northern hardwood stands. There are no recent records of this species (NatureServe2020).

Effects to these lichen species will be discussed together because effects would be similar.

Direct, Indirect, and Cumulative Effects

This project would have minimal direct effects on this species. Girdling would have no direct effects to this species. Since girdling would only be directly over spruce seedlings and midstory trees micro habitat is not likely to be altered. Planting and transplants could damage individuals that may be present underground, but individuals are more likely to be under moist logs where trees wouldn't be planted. Indirect effects would reduce some habitat in the long term. Indirect effect would be beneficial for these species in the long term. This project is designed to increase spruce and spruce/northern habitats favored by both species. There would be no past, present, or future actions that would be cumulative with this project

Determination of Effects

Implementing this propose action may impact individuals but is **not likely to cause a trend towards federal listing** of this species because implementation would increase habitat for these species.

Monarch

Introduction

North America is considered the core of the monarch's range but the overall range extends through Central America into northern South America. This species can also be found on other continents and islands several of which appear to be nonnative originating from introductions. The majority North American populations are strongly migratory, overwintering in a few dozen locations in California and Mexico then spreading to the rest of the United States and Canada during the spring and summer months. Populations is south Florida and the Gulf Coast are non-migratory. The North American populations have declined significantly in the last 20 years, especially the last 10. Estimates from the overwintering sites in Mexico in 2013-2014 showed a 90% drop from the 20-year average for the eastern population. The greatest threat to this species is habitat loss in its over wintering grounds and pesticide usage (NatureServe 2020).

Milkweeds are the host plant for this species in all life stages. Most milkweeds contain cardiac glycosides which are stored in the bodies of both the caterpillar and adult. These poisons are distasteful to birds and other vertebrate predators. After tasting a Monarch, a predator might associate the bright warning colors of the adult or caterpillar with an unpleasant meal, and avoid Monarchs in the future. Adult feed on nectar from milkweeds, dogbane, lilac, red clover, lantana, thistles, goldenrods, blazingstars, ironweed, and tickseed sunflower (NatureServe 2020).

Direct, Indirect, and Cumulative Effects

This project would have little to no direct impacts to monarchs. Monarch are most likely to be found in areas with more sunlight and lots of forbs/flowers like milkweed. Girdling areas would be directly over existing spruce midstory or seedling not effecting a large enough area to alter habitat for this species. Plantings in open areas could indirectly reduce habitat in the long term. However, there is plenty of habitat available in the high elevation balds and other open areas on the Mount Rogers NRA. There are no actions cumulative with this project

Determination of Effects

Implementation of the project **may impact individuals** but is **not likely to cause a trend towards federal listing** of this species because impacts would not directly affect this species and indirect effects may slightly reduce habitat in the long term. However, there will be plenty of habitat available on the rest of the NRA.

Appalachian shield lichen (Heterodermia appalachensis)

Introduction

Appalachian shield lichen has been found sporadically in the southern Appalachians, southern Arizona, Texas, and central Mexico. Sample findings in the Appalachians encompass Maryland, North Carolina, and West Virginia. Two findings have been observed in the Sonoran Desert in Arizona, and approximately eight recorded findings in central Mexico. Although it has been described as "not uncommon" in the Appalachians, relatively fewer collections have been made in this region. It is an imperiled species, found growing in open areas on tree trunks in humid environments (NatureServe, 2020)[1]. In Maryland, Appalachian shield lichen is typically found growing on oak trees. Found at elevations between 1800 – 2200m, it is often associated with mosses in various communities such as oak pine forests, maple forests, Juniper, *Abies religiosa*, and oak-pine-cypress forests. In Mexico, this species grows on tree trunks (oak, fir, juniper) and rocks (Moberg & Nash, 1999)[5].

A foliose lichen (Heterodermia erecta)

Introduction

This foliose lichen has historically been found in a small region of Georgia and North Carolina (Hodkinson, 2010)[6]. Recent sampling show that it is critically imperiled in North Carolina and Virginia. Species abundance and is presently under review in Georgia; the species is classified as critically imperiled overall (NatureServe, 2020)[1].

A foliose lichen (Hypotrachyna oostingii)

Introduction

Hypotrachyna oostingii grows at high elevations in the southern Appalachians in North Carolina, Tennessee, and Virginia. An imperiled species, it is categorized as possibly extinct in Virginia, and under review in North Carolina. It has been commonly associated with fir (*Abies fraseri*) and spruce (*Picea rubens*) forests, less often with hardwood (*Betula latea*), and has rarely been observed on rock. Decline of fir trees in the southern Appalachians over recent decades suggests that this lichen species has declined due to habitat loss (NatureServe, 2020)[1].

Virginia hypotrachyna lichen (Hypotrachyna virginica)

Introduction

Endemic to the southern Appalachians, this species has been found in West Virginia, Virginia, North Carolina, and Tennessee. It is classified as a critically imperiled species, and is under review in West Virginia and Tennessee, critically imperiled in North Carolina, and possibly extinct in Virginia. The habitat for this species includes *Abies*, *Picea*, *Rhododendron*, and hardwood trees in spruce-fire and fire-cherry communities. It is typically found at higher elevations, but has also been observed less frequently at lower elevations (NatureServe, 2020)[1].

A lichen (Lecanora masana)

Introduction

Lecanora masana is endemic to high elevations in the southern Appalachians. The geographic range for this species encompasses western North Carolina and southern Virginia. Although it is regarded as a threatened species (Lendemer & Harris, 2015)[7], the population size and health of *Lecanora masana* has not been monitored or assessed (NatureServe, 2020)[1]. It grows most frequently on ericaceous shrubs and *Abies fraseri* (Allen & Lendemer, 2016)[8]. The threatened status of this species is attributable to threats to the ecosystem in which it is found, including invasive pests and climate change (Lendemer & Harris, 2015)[7].

Effects to these lichen species will be discussed together because effects would be similar.

Direct, Indirect, and Cumulative Effects

Direct effects are expected to be minimal for these species. Girdling may damage some lichen if present at the direct girdling site, but others on the trees would not be directly affected. Planting and transplanting sites would have no direct effects on these species. Indirect effects would be negative in the short term for the shad favoring species, but beneficial in the long term. Girdling would allow more light into the midstory and understory to encourage young spruce to go into height growth. This in turn would make conditions for shad favoring lichens less favorable in the short term. However, in the long term this would increase shading by allowing more spruce to reach the canopy improving the spruce habitat favored by the shad favoring lichens. This would have an opposite effect for the light favoring lichens, however, these species are less likely to be present in the girdling sites because they are currently being shaded by hardwoods. Planting in open areas negatively impact individuals of light favoring lichen species, but the most favorable habitat high elevation bald would still be available.

Determination of Effects

Implementing this project **may impact individuals** but is **not likely to cause a trend towards federal listing** for the lichen species listed above. In the long run this project would improve habitat for shad favoring lichen and decrease habitat for light favoring lichens. However, good quality habitat will still be available for light favoring lichens in the project area.

A liverwort (Bazzania nudicaulis)

Introduction

Residing at high elevations in spruce-fir forests of the southern Appalachians, this species can be found in North Carolina, Tennessee, and Virginia. The overall conservation status of *Bazzania nudicaulis* is imperiled, with the species being locally imperiled in North Carolina and Tennessee, and critically imperiled in Virginia. The species is commonly found on the bark of mature fir trees. Wooly balsam adelgid indirectly threaten this liverwort by devastating the Fraser fir trees on which they live. Death of mature fir trees due to climate changes have opened the forest canopy for succession. *Bazzania nudicaulis* has shown the ability to colonize regenerate tree species, possibly reducing its decline in the ecosystem (NatureServe, 2020)[1].

A Liverwort (Plagiochila corniculata)

Introduction

Plagiochila corniculata is endemic to a limited region of the southern Appalachians, encompassing North Carolina, Tennessee, and Virginia. It is classified as imperiled in North Carolina, critically imperiled in Tennessee, and possibly extinct in Virginia. However, this species (also known as *P. exigua*) is also found throughout the British Isles, France, and coastal Norway. The global conservation status of this liverwort is classified as apparently secure. In North America, this species is typically found in densely shaded and humid mountain summits that are often surrounded by fog. It usually occurs in the *Abies fraseri-Picea rubra* association, at 5-10ft or higher on fir tree bark (NatureServe, 2020)[1]. Found most commonly on *A. fraseri* bark, this species is also associated with *Leptoscyphus cuneifolius, Bazzania nudicaulis, Frullania tamarisci asagrayana, Sphenolobopsis pearsoni*, and less frequently on *Lejeunea ulicina* and *Herberta adunca tenuis*. It occasionally occurs on the bark and associates of *Betula lutea*, in addition to *Pinguicula sharpii* and *Harpelejeuna ovata* (Schuster, 1980)[12]. Habitat fragmentation and land-use conversion have been low-level threats to *P. corniculata* (NatureServe, 2020)[1].

A Liverwort (Plagiochila sullivanti var. sullivanti)

Introduction

This species is native to the Appalachians, but is known to have a broad range. It has been observed in Georgia, Tennessee, Kentucky, Virginia, West Virginia, and the Carolinas. Presently, the conservation status of *Plagiochila sullivanti var. sullivanti* is under review in Pennsylvania, Virginia, and Tennessee; it is classified as imperiled in North Carolina. The global conservation status for this species variety is intrinsically imperiled due to its limited distribution worldwide (NatureServe, 2020)[1]. It is found in areas with very high constant atmospheric humidity and protection from rain and submersion. This includes deeply shaded and overhung rock walls and ledges, waterfalls, and the underside of strongly projecting ledges. It is known to occur on ledge undersides with *Anastrophyllum minutum, Scapania nemorosa, Plagiochila asplenioides,* and *Herberta adunca var. tenuis* (Schuster, 1980)

A Liverwort (Radula tenax)

Introduction

Endemic to the Appalachians, *Radula tenax* has a range extending from Maine to South Carolina, and is also found in New Brunswick, Canada (Hicks, 1992)[11]. It has a global conservation status of 'vulnerable,' and is under review in Maine, New Hampshire, Vermont, Massachusetts, Connecticut, Rhode Island, New York, Maryland, Virginia, West Virginia, South Carolina, and Georgia. It is presumed extinct in Vermont and Pennsylvania, and is apparently secure, imperiled, and vulnerable respectively in Virginia, North Carolina, and Tennessee (NatureServe, 2020)[1]. *Radula tenax* is found in montane and sub-montane environments; it occurs at higher elevations southward, and at lower elevations going northward. This liverwort is

rare and sporadically distributed in the North, and is frequently found on shaded rocks in the South (Schuster, 1980)[12].

Horsehair Threadwort

Introduction

In the United States, this liverwort species is exclusively found in the highest peaks of the southern Appalachians of Virginia, North Carolina, and Tennessee. Its global conservation status is designated as imperiled. The species is critically imperiled in Tennessee and Virginia, and is imperiled in North Carolina. Horsehair threadwort is known to grow on the bark of Fraser fir (*Abies fraseri*), mountain ash, and red spruce trees on mountains peaks above 1830m. It thrives in dense shade and moist condition (e.g. fog, mist). Species associated with this liverwort include *Bazzania nudicaulis, Plagiochila corniculate, Herbertus aduncus,* and *Anomylia cuneifolia*. Invasive balsam wooly adelgids have devastated southern high elevation spruce-fir forests, contributing to the horsehair threadwort's imperiled status (NatureServe, 2020)[1].

Effects to these liverwort species will be discussed together because effects would be similar.

Determination of Effects

Direct, Indirect, and Cumulative Effects

Direct effects are expected to be minimal for these species. Girdling may damage some liverworts if present at the direct girdling site or planting sites, but others on the trees would not be directly affected. Indirect effects would be negative in the short term because these species favor moist shaded conditions. However effect would be beneficial in the long term. Girdling would allow more light into the midstory and understory to encourage young spruce to go into height growth. This in turn would make conditions for liverworts less favorable in the short term. However, in the long term this would increase shading by allowing more spruce to reach the canopy improving the spruce habitat favored by these shade favoring species.

Determination of Effects

Implementing this project **may impact individuals** but is **not likely to cause a trend towards federal listing** for the liverwort species listed above. This project may negatively impact individuals in the short term, but in the long run this project would improve habitat for liverworts.

Northeastern Peatmoss

Introduction

Endemic to northeastern North America, this species is known through New Hampshire to Maryland in the United States. It has also been observed in the southern Appalachians of North

Carolina and Tennessee. The global conservation status for this species is classified as secure. It is under review in Maine, New York, Massachusetts, Rhode Island, Connecticut, New Jersey, Maryland, and Tennessee. The species is critically imperiled in New Hampshire, Delaware, and Pennsylvania, and is possibly extinct in North Carolina. Its abundance in the Canadian Maritime provinces contributes to its secure global conservation status (NatureServe, 2020)[1]. Northeastern peatmoss grows in high, dense cushions or mounds. It occurs in shaded habitats with medium acidity, poor fens, and ombrotrophic bogs. Common associations include *Picea mariana* or *Chamaecyparis* (Crum & Anderson, 1981)[13].

Direct, Indirect, and Cumulative Effects

Direct effects are expected to be minimal for these species. Peatmoss in mostly located on rocks and the forest floor so this species would not be directly damaged by girdling. Indirect effects would be negative in the short term because these species favor moist shaded conditions. Girdling would allow more light to reach the forest floor potentially altering microclimate to aHowever, effects would be beneficial in the long term. Girdling would allow more light into the midstory and understory to encourage young spruce to go into height growth. This in turn would make conditions for liverworts less favorable in the short term. However, in the long term this would increase shading by allowing more spruce to reach the canopy improving the spruce habitat favored by these shade favoring species.

Determination of Effects

Implementing this project **may impact individuals** but is **not likely to cause a trend towards federal listing** for this species. This project may negatively impact individuals in the short term, but in the long run this project would improve habitat for peatmoss.

Fraser Fir

Introduction

Native to the southern Appalachians, Fraser fir occurs at high elevations from southern Virginia to western North Carolina and eastern Tennessee. The global conservation status of this species is 'imperiled.' In Virginia and Tennessee, it is a critically imperiled species. It is classified as imperiled in North Carolina, and has been introduced to West Virginia and Georgia as an exotic species for ornamental landscaping and Christmas trees (NatureServe, 2020; Sullivan, 1993)[1 14]. This species occurs at elevations exceeding 1500m, often occurring with red spruce (*Picea rubens*). It becomes relatively dominant above 1900m, where it is found in nearly pure forest stands on exposed ridges and summits. Fraser fir is threatened by balsam woolly adelgid, an invasive insect parasite which infests and causes selective mortality of adult fir trees. Furthermore, a long-term decline of at least 70% of the Fraser fir population is anticipated due to logging and habitat conversion (NatureServe, 2020)[1].

Direct, Indirect, and Cumulative Effects

Direct effects are expected to be minimal for these species. This species is mostly present on Mount Rogers and much less prevalent on Whitetop. There would be no direct effects to this species because it would not be girdled. Indirect effects would beneficial for this species. Activities that benefit red spruce would also benefit fraser fir. If fraser fir is found in the release site it would be released as well. There are no known past, present, or future activities that would be cumulative with this project so no cumulative effects are expected.

Determination of Effects

Implementing this project **may impact individuals** but is **not likely to cause a trend towards federal listing** for fraser fir. Implementing this project would be beneficial to this species.

Mountain Bittercress

Introduction

The mountain bittercress is native to the southern Appalachians, spanning Virginia, North Carolina, Georgia, and Tennessee. Its global conservation status is listed as vulnerable. Regionally, it is critically imperiled in Virginia and Georgia, and imperiled in Tennessee and North Carolina (NatureServe, 2020)[1]. Mountain bittercress exclusively occurs in high-elevation riparian environments, approximately above 1000m in streams and seeps. It is common in northern hardwood forest communities, or in transitional areas between birch-red spruce and red spruce-Fraser fir forests (Schafale & Weakly, 1990)[23]. Threats to this species include land-use conversion, habit fragmentation, and forest management practices. The combined influences of non-native infestations, landscape changes, forest succession, and atmospheric pollution deposition may determine the long-term viability of the mountain bittercress (NatureServe, 2020)[1].

Direct, Indirect, and Cumulative Effects

Direct effects are expected to be minimal for these species. There would be no direct effects to this species from girdling activities, and minimal direct effects from plantings/transplanting seedlings. Plantings and transplanting's are less likely to take place in riparian areas where this species is often found. Plant surveys would be conducted prior to implementation to account for rare species, and if this species is rare in the project area it would be avoided. Indirect effects would minimal for this species. This species is present in northern hardwoods and transitional zones between northern hardwood and spruce. Habitat may be slightly reduce in the project area by transitioning some mixed habitat to montane spruce in the long term, however, there would be plenty of habitat still available in the project area. There are no known past, present, or future activities that would be cumulative with this project so no cumulative effects are expected.

Determination of Effects

Implementing this project **may impact individuals** but is **not likely to cause a trend towards federal listing** for fraser fir. Implementing this project would be beneficial to this species.

4. Summary of determinations and signature of preparers

Based on the information and analysis above, the following determinations of effects were made for the activities proposed in this project.

Common Name	Scientific Name	Species Type	Determination of Effects
Northern Pigmy Salamander	*Desmognathus organi*	Salamander	May impact but is not likely to cause a trend towards federal listing
Weller's Salamander	*Plethodon welleri*	Salamander	May impact but is not likely to cause a trend towards federal listing
Eastern Smallfooted Bat	*Myotis leivii*	Mammal	No Impacts
Tricolored Bat	*Perimyotis subflavus*	Mammal	May impact but is not likely to cause a trend towards federal listing
Highland Slitmouth	*Stenotrema altispira*	Snail	May impact but is not likely to cause a trend towards federal listing
Montane Centipede	*Escaryus cryptorobius*	Centipede	May impact but is not likely to cause a trend towards federal listing
Whitetop Mountain Centipede	*Escaryus orestes*	Centipede	May impact but is not likely to cause a trend towards federal listing
Monarch	*Danaus plexippus*	Butterfly	May impact but is not likely to cause a trend towards federal listing
Witch's-hair lichen	*Alectoria fallacina*	Lichen	May impact but is not likely to cause a trend towards federal listing
Appalachian Shield Lichen	*Heterodermia appalachensis*	Lichen	May impact but is not likely to cause a trend towards federal listing
A Foliose Lichen	*Heterodermia erecta*	Lichen	May impact but is not likely to cause a trend towards federal listing
A Foliose Lichen	*Hypotrachyna oostingii*	Lichen	May impact but is not likely to cause a trend towards federal listing
Virginia Hypotrachyna	*Hypotrachyna virginica*	Lichen	May impact but is not likely to cause a trend towards federal listing
A Lichen	*Lecanora masana*	Lichen	May impact but is not likely to cause a trend tow May impact but is not likely to cause a trend towards federal listing ards federal listing
A Liverwort	*Bazzania mnudicaulis*	Liverwort	May impact but is not likely to cause a trend towards federal listing
A Liverwort	*Plagiochila corniculata*	Liverwort	May impact but is not likely to cause a trend towards federal listing

A Liverwort	*Plagiochila sallivantii var. sallivantii*	Liverwort	May impact but is not likely to cause a trend towards federal listing
A Liverwort	*Redula tenax*	Liverwort	May impact but is not likely to cause a trend towards federal listing
A Liverwort	*Sphenlobopsis pearsonli*	Liverwort	May impact but is not likely to cause a trend towards federal listing
Northeastern Peatmoss	*Sphagnum flavicomans*	Moss	May impact but is not likely to cause a trend towards federal listing
Fraser Fir	*Abies fraseri*	Vascular Plant	May impact but is not likely to cause a trend towards federal listing
Mountain bittercress	*Cardamine clematis*	Vascular Plant	May impact but is not likely to cause a trend towards federal listing

These determinations were made by qualified staff of the George Washington/Jefferson National Forests based on the best available science and other relevant information. If new information or changed circumstances affect these determinations, forest staff will reinitiate consultation pursuant to Forest Service policies and requirements under Sect. 7 of the Endangered Species Act.

__/s/ *Brittany B. Phillips*___ Date__08/12/2020__

Brittany B. Phillips
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Documentation of Threatened, Endangered or Sensitive Species Occurrences for (PROJECT NAME)
Coding for Occurrence Analysis Results (OAR) for 199 species

Forest updated November 26, 2018 (based on Region 8 sensitive species list effective March 15, 2018)

OAR	GW	J	Species Name	Common Name	Range on or near GWJNFs	Habitat - Detail	TES	GRank	VA SRank	WV SRank
VERTEBRATE										
Fish										
1	-	X	*Ammocrypta clara*	Western sand darter	Clinch R, Powell R	Aquatic-rivers.	S	G3	S1	-
1	-	X	*Chrosomus cumberlandensis*	Blackside dace	Upper Cumberland R, Upper Powell R, Poor Fk Cumberland R, Clinch R drainage - Staunton Ck McGhee Ck	Aquatic-streams.	T	G2	S1	S3 (KY)
1	-	X	*Erimonax monachus*	Spotfin chub	Lower N Fk Holston R	Aquatic-streams.	T	G2	S1	-
1	-	X	*Erimystax cahni*	Slender chub	Two sites - Powell R, Lee Co	Aquatic-rivers.	T	G1	S1	-
1	-	X	*Erimystax insignis*	Blotched chub	Clinch-Powell system, S Fk Holston R	Aquatic-streams/rivers.	S	G4	S3	-
1	-	X	*Etheostoma acuticeps*	Sharphead darter	S and Middle Fk Holston R	Aquatic-rivers.	S	G3	S1	-
1	-	X	*Etheostoma cinereum*	Ashy Darter	Upper Clinch R, Guest R gorge	Aquatic-rivers.	S	G2G3	S1	-
1	-	X	*Etheostoma osburni*	Candy darter	Big Stony Ck, Dismal Creek, Cripple Creek (New R watershed)	Aquatic-streams.	E	G3	S1	S2
1	-	X	*Etheostoma percnurum*	Duskytail darter	Copper Ck, Clinch R	Aquatic-rivers.	E	G1	S1	-
1	-	X	*Etheostoma denoncourti*	Golden darter	Four sites Clinch R, lower Copper Ck.	Aquatic-rivers. Formerly: Tippecanoe darter, *Etheostoma tippecanoe.*	S	G3G4	S1	S2
1	-	X	*Etheostoma vulneratum*	Wounded darter	N & S Fk Holston R, Clinch R, Powell R.	Aquatic-Rivers.	S	G3	S2S3	-
1	-	X	*Icthyomyzon greeleyi*	Mountain brook lamprey	M, N Fk Holston R, Copper Ck, Indian Ck, Clinch R, Powell R	Aquatic-rivers.	S	G3G4	S2	S1
1	-	X	*Notropis ariommus*	Popeye shiner	N Fk Holston R, Clinch R, Powell R	Aquatic-rivers.	S	G3	S2S3	S2
1	X	X	*Notropis semperasper*	Roughhead shiner	Upper James R watershed above Buchanan (Cowpasture R, Jackson R, Craig Ck)	Aquatic-rivers.	S	G2G3	S2S3	-
1	-	X	*Noturus flavipinnis*	Yellowfin madtom	Lower & Mid reaches of Copper Ck, Powell R	Aquatic-streams.	T	G1	S1	-
1	X	X	*Noturus gilberti*	Orangefin madtom	S Fk Roanoke R watershed, Roanoke R above Salem, Craig Ck, Johns Ck, Cowpasture R	Aquatic-streams.	S	G2	S2	-
1	-	X	*Percina burtoni*	Blotchside logperch	N Fk Holston R, Clinch R, Copper Ck, Little R	Aquatic-rivers.	S	G2G3	S1	-
1	-	X	Percina rex	Roanoke logperch	Upper Roanoke R watershed	Aquatic-rivers.	E	G1G2	S1S2	-
1	-	X	*Percina williamsi*	Sickle darter	S & N Fk Holston R above Saltville, Clinch R - lower Copper Ck.	Aquatic-rivers. Formerly: *Percina macrocephala*.	S	G2	S1S2	S2
7	-	X	*Phenacobius teretulus*	Kanawha minnow	Upper New R watershed	Aquatic-streams.	S	G3G4	S2S3	S1
Amphibian										
1	-	X	*Aneides aeneus*	Green salamander	Bland, Dickenson (Skegg Boulderfield), Lee, Russell, Scott, Tazewell, Washington, Wise, Wythe Cos VA; Greenbrier, Monroe, Pendleton Cos WV	Damp (not wet) crevices in shaded rock outcrops and ledges; beneath loose bark; in cracks of standing or fallen trees; in or under logs on ground.	S	G3G4	S3	S3
7	-	X	*Cryptobranchus alleganiensis*	Hellbender	N & S Fk Holston (Whitetop Laurel), Clinch R, Copper Ck, Powell R.	Aquatic-rivers, streams.	S	G3G4	S2S3	S2
6	-	X	*Desmognathus organi*	Northern pygmy salamander	Grayson, Smyth, Washington Cos. Whitetop Mt. and Mt. Rogers	Spruce-fir forests and adjacent northern hardwoods, >3600'	S	G3	S2	-
1	-	X	*Plethodon hubrichti*	Peaks of Otter salamander	Peaks of Otter, Apple Orchard Mtn	Mixed oak, late successional with loose rocks and logs, >1800'.	S	G2	S2	-
1	X	-	*Plethodon punctatus*	Cow Knob salamander	Shenandoah Mtn, VA & WV	Mixed oak, late successional with loose rocks and logs, >2500'.	S	G3	S2	S1
1	X	-	*Plethodon sherando*	Big Levels salamander	Big Levels, Augusta Co	Forest and rocky talas slopes 1900' – 3580'.	S	G2	S2	-
1	X	-	*Plethodon virginia*	Shenandoah Mountain salamander	Rockingham Co	Temperate forests between 3600' – 3900'.	S	G2G3	S2	SNR
6	-	X	*Plethodon welleri*	Weller's salamander	Mt Rogers & Whitetop Mtn	Spruce-fir forests and adjacent northern hardwoods.	S	G3	S2	-
Reptile										
1	X	-	*Clemmys guttata*	Spotted turtle	Maple Flats, Augusta Co	Mostly unpolluted, shallow bodies of water with a soft bottom and aquatic vegetation; small marshes, marshy pastures, bogs, fens, woodland streams, swamps, small ponds, vernal pools, and lake margins.	S	G5	S4	S1
1	X	-	*Glyptemys insculpta*	Wood turtle	Page, Rockingham, Shenandoah Cos; N Shenandoah R watershed	Along permanent streams during much of year; in summer may roam widely overland; variety of terrestrial habitats adjacent to streams, including deciduous woods, cultivated fields, and woodland bogs, marshy fields and pastures. Overwinters in streams.	S	G3	S2	S3
1	X	X	*Pituophis melanoleucus*	Pinesnake	Historic records from Alleghany, Augusta, Botetourt, Craig, Rockingham Cos., VA: Monroe Co, WV. No current records known from GWJNF.	Xeric, pine-dominated or pine-oak woodland with open, low understory established on sandy soils; require forest openings, with level, well-drained sandy soils and little shrub cover as nesting/hibernation sites.	S	G4	S1?	SH
Bird										
1	-	X	*Ammodramus henslowii*	Henslow's Sparrow	Pulaski Co (Radford Arsenal). No nest records known on GWJNF.	Open fields, meadows with grass interspersed with weeds or shrubby vegetation, especially in damp or low-lying areas; unmowed hayfields.	S	G4	S1B	S3B

OAR	GW	J	Species Name	Common Name	Range on or near GWJNFs	Habitat - Detail	TES	GRank	VA SRank	WV SRank
Mammal										
1	-	-	*Corynorhinus rafinesquii*	Rafinesque's big-eared bat	Has not been found in VA but has occurred nearby in WV, KY, & TN. In 1978, a large nursery colony was found in Hancock Co., TN, very close to the VA-TN border. Only possible in Lee, Scott, Washington Co.	Caves in winter, large hollow trees summer, may also use cliff-lines, buildings, and bridges in summer. Not on VADCR-NHP "Rare Animal" list.	S	G3G4	-	S1
1	X	X	*Corynorhinus townsendii virginianus*	Virginia big-eared bat	Summer: VA - Tazewell Co (3 caves), Highland Co (1 cave); WV - Pendleton Co (4 caves); Winter: Highland, Rockingham, Bland, and Tazewell Cos (6 caves); Pendleton Co (6 caves). Largest VA population in Tazewell Co and largest WV population in Pendleton Co. Small numbers of bats (usually <10) in a few other widely scattered caves during summer months. Bath & Pulaski Co records are historic. No occupied caves currently known on Forest.	Resides in caves winter and summer. Short distance migrant (<40 miles) between winter and summer caves. Forages primarily on moths and foraging habitat is common (fields, forests, meadows, etc.). Forages within 6 miles of summer caves. USFWS Critical Habitat is 5 caves in WV (4 Pendleton Co and 1 Tucker Co). Closest Critical Habitat cave to GWJNF is ~3 miles in Pendleton Co, WV. OAR code of "2" used when project further than 6 miles from summer or winter occupied cave.	E	G3G4T2	S1	S2
6	-	X	*Glaucomys sabrinus coloratus*	Carolina northern flying squirrel	Mt Rogers & Whitetop area	Spruce-fir forests and adjacent northern hardwoods.	E	G5T2	S1	-
1	X	-	*Glaucomys sabrinus fuscus*	Virginia northern flying squirrel	Laurel Fork area, Highland Co	Spruce forests and adjacent northern hardwoods.	S	G5T2	S1	S2
6	-	X	*Myotis grisescens*	Gray bat	Ridge & Valley, Clinch R watershed; Russell Fk at Russell Fk/Pound R confluence.	Caves winter and summer, forages widely.	E	G3	S1	-
6	X	X	*Myotis leibii*	Eastern small-footed bat	Blue Ridge, Ridge & Valley, Cumberland Mtns	Hibernates in caves during winter, roosts in crevices of large rock outcrops, cliffs, and under large rocks in talus & boulder-fields during summer, plus similar man-made structures like rip-rap and bridges, forages widely in all forested and open habitat types over both ridges and valleys.	S	G1G3	S2	S1
6	X	X	*Myotis septentrionalis*	Northern long-eared bat	Blue Ridge, Ridge & Valley, Cumberland Mtns	Hibernates in crevices and cracks of cave walls during winter (sometimes mines & tunnels), difficult to find and rarely seen. During summer, forages widely and roosts singly or in colonies underneath bark, in cavities, or in crevices of both live and dead trees. Also may roost in structures like barns, sheds, & houses. Decline due to WNS.	T	G1G2	S3	S3
6	X	X	*Myotis sodalis*	Indiana bat	Blue Ridge, Ridge & Valley, Cumberland Mtns	Caves winter, upland hardwoods summer, forages widely along riparian areas and open woodlands.	E	G2	S1	S1
6	X	X	*Perimyotis subflavus*	Tricolored bat	Every county in VA, WV, KY	Caves in winter: Caves, trees, cliffs, barns during summer months. Decline due to WNS. Formally: Eastern pipistrelle.	S	G3	S1S3	
INVERTEBRATE										
Snail (Mollusk, Class Gastropoda)										
1	X	-	*Fontigens tartarea*	Organ cavesnail	Rock Camp Cave (1 mile from FS), McClung-Zenith Cave (1.5 mile from FS), Monroe Co, WV; Greenbrier, Pocahontas, Randolph, Tucker Cos, WV; Bath, Highland Cos, VA	Caves. Obligate troglobite.	S	G2	S1S2	S2
1	-	-	*Gastrodonta fonticula*	Appalachia bellytooth	No known records on GWJ. Scott and Wise Co records need to be verified.	Damp, wooded environments, particularly in deep piles of wet leaf litter and around rotting wood debris.	S	G3G4	SU	SNR
1	X	X	*Glyphyalinia raderi*	Maryland glyph	Alleghany, Montgomery Cos	Calciphile, edge of seeps within leaf litter. May burrow.	S	G2	S1S2	S2
1	X	-	*Helicodiscus diadema*	Shaggy coil	Alleghany Co	Calciphile; semi-open, calcium-rich environments, especially limestone rubble/talus and thinly wooded limestone hills.	S	G1	S1	-
1	X	X	*Helicodiscus triodus*	Talus coil	Alleghany, Botetourt, Rockbridge Cos	Calciphile, limestone rubble on wooded hillsides and near cave entrances.	S	G2	S1S2	SH
1	-	X	*Io fluvialis*	Spiny riversnail	Clinch R, N Fk Holston R	Aquatic-rivers.	S	G2	S2	-
1	-	-	*Paravitrea septadens*	Brown supercoil	Breaks Interstate Park, Dickenson Co; Buchanan Co., VA. No known records on GWJ.	Steep forested slopes and in ravines, often among woody debris, rocks, or deeper leaf litter; mixed eastern hemlock-hardwood forest, also in richer hardwood stands.	S	G1	S1	-
6	-	-	*Stenotrema altispira*	Highland slitmouth	No known records on GWJ. Grayson and Smyth Co records need to be verified.	Higher elevations, in leaf litter and woody debris.	S	G3	S1	-
1	-	-	*Ventridens decussatus*	Crossed dome	No known records on GWJ. Scott Co records need to be verified.	High elevations, usually >3000', in leaf litter, particularly oak leaves.	S	G3	SU	-
1	-	-	*Vertigo bollesiana*	Delicate vertigo	No known records on GWJ. VA and WV records need to be verified.	Leaf litter often under shrubs, on cliff-face ledges and boulder tops in mesic upland forest, and damp microsites in northern white cedar wetlands.	S	G4	SU	-
1	X	-	*Vertigo clappi*	Cupped vertigo	Greenbrier & Pendelton Cos, WV	Well-rotted, humid leaf litter and fine soil on shaded boulders, talus, ledges, and bases of forested lime-rich bedrock outcrops.	S	G1G2	SU	SNR
Mussel (Mollusk, Class Bivalvia)										
1	-	X	*Alasmidonta marginata*	Elktoe	Greenbrier R & New R, WV. Upper New R; Reed Creek; Sinking Creek (Giles Co.); Wolf Creek (Bland Co.); upper S Fk Holston; historical Upper Clinch.	Aquatic-rivers.	S	G4	S1S2	S2
1	X	-	*Alasmidonta varicosa*	Brook floater	Potomac drainage	Aquatic-rivers.	S	G3	S1	S1
1	-	X	*Alasmidonta viridis*	Slippershell mussel	Historic in Upper Clinch R excluding Copper Creek where extant; Upper S Fk Holston	Aquatic-rivers.	S	G4G5	S1	-
1	-	X	*Cumberlandia monodonta*	Spectaclecase	2 sites Clinch R	Aquatic-rivers.	E	G3	S1	-
1	-	X	*Cyprogenia stegaria*	Fanshell	Lower Clinch R, Scott Co	Aquatic-rivers.	E	G1Q	S1	S1

OAR	GW	J	Species Name	Common Name	Range on or near GWJNFs	Habitat - Detail	TES	GRank	VA SRank	WV SRank
1	-	X	*Dromus dromas*	Dromedary pearlymussel	Clinch R, Powell R, N Fk Holston R	Aquatic-rivers.	E	G1	S1	-
1	X	X	*Elliptio lanceolata*	Yellow lance	Roanoke R, James R	Aquatic-rivers.	T	G2G3	S2S3	-
1	-	X	*Epioblasma brevidens*	Cumberlandian combshell	Clinch R, Powell R, N Fk Holston R	Aquatic-rivers.	E	G1	S1	-
1	-	X	*Epioblasma capsaeformis*	Oyster mussel	Clinch R, Powell R, N Fk Holston R	Aquatic-rivers.	E	G1	S1	-
1	-	X	*Epioblasma florentina aureola*	Golden riffleshell	Restricted to lower 1.0 mile of Indian Ck to Clinch R. All other historical populations in M & Upper Tennessee R system now extirpated.	Aquatic-rivers. Formerly: tan riffleshell.	E	G1T1	S1	-
1	-	X	*Epioblasma torulosa gubernaculum*	Green-blossom pearlymussel	Clinch R, N Fk Holston R	Aquatic-rivers.	E	G2TX	SX	-
1	-	X	*Epioblasma triquetra*	Snuffbox	Clinch R, Powell R, N Fk Holston R	Aquatic-rivers.	E	G3	S1	S2
1	-	X	*Fusconaia cor*	Shiny pigtoe	Clinch R, Powell R, N Fk Holston R, Copper Ck	Aquatic-rivers.	E	G1	S1	-
1	-	X	*Fusconaia cuneolus*	Fine-rayed pigtoe	Clinch R, Powell R, Copper Ck, Little R	Aquatic-rivers.	E	G1	S1	-
1	-	X	*Fusconaia masoni*	Atlantic pigtoe	Roanoke R, Craig Ck drainage	Aquatic-rivers.	S	G2	S2	-
1	-	X	*Hemistena lata*	Cracking pearlymussel	Clinch R, Powell R	Aquatic-rivers.	E	G1	S1	-
1	-	X	*Lampsilis abrupta*	Pink mucket	Clinch R	Aquatic-rivers.	E	G2	SX	S1
1	X	-	*Lampsilis cariosa*	Yellow lampmussel	N Fk Shenandoah R; Shenandoah, Warren Cos.	Aquatic-rivers.	S	G3G4	S2	S1
1	-	X	*Lasmigona holstonia*	Tennessee heelsplitter	Upper Clinch, N and M Fk Holston R drainages; Wolf Ck, Bland Co below Burkes Garden	Aquatic-streams.	S	G3	S1	-
1	X	-	*Lasmigona subviridis*	Green floater	Widely distributed in N & S Fk Shenandoah R, Pedlar R, James R	Aquatic-rivers.	S	G3	S2	S2
1	-	X	*Lemiox rimosus*	Birdwing pearlymussel	Clinch R, Powell R, Copper Ck, Little R	Aquatic-rivers.	E	G1	S1	-
1	X	X	*Parvaspina collina*	James spinymussel	Potts Ck, Craig Ck, Johns Ck, Patterson Run, Pedlar R, Cowpasture R, Mill Ck (Deerfield)	Aquatic-rivers. Formerly: *Pleurobema collina*.	E	G1	S1	S1
9	-	X	*Pegias fabula*	Little-winged pearlymussel	Clinch R, N Fk Holston R, S Fk Holston R, Little R	Aquatic-streams.	E	G1	S1	-
1	-	X	*Plethobasus cyphyus*	Sheepnose	Clinch R, Powell R	Aquatic-rivers.	E	G3	S1	S1
1	-	X	*Pleurobema cordatum*	Ohio pigtoe	Clinch R	Aquatic-rivers.	S	G4	S1	S2
7	-	X	*Pleurobema oviforme*	Tennessee clubshell	Clinch R, Powell R, N, Middle, S Fk Holston R	Aquatic-streams.	S	G2G3	S2S3	-
1	-	X	*Pleurobema plenum*	Rough pigtoe	Clinch R	Aquatic-rivers.	E	G1	SH	SH
1	-	X	*Pleurobema rubrum*	Pyramid pigtoe	Upper Clinch R	Aquatic-rivers.	S	G2G3	SH	-
7	-	X	**Pleuronaia barnesiana**	Tennessee pigtoe	Clinch R, Powell R, N Middle, S Fk Holston R	Aquatic-rivers.	S	G2G3	S2	-
7	-	X	*Pleuronaia dolabelloides*	Slabside pearlymussel	Clinch R, M Fk Holston, N Fk Holston R	Aquatic-rivers.	E	G2	S2	-
7	-	X	*Ptychobranchus subtentum*	Fluted kidneyshell	Holston R., Powell R., Indian R., Clinch R., Little R., Copper Ck., Big Moccasin Ck. Critical Habitat: Indian Ck, VA: M Fk Holston R. VA: Big Moccasin Ck., VA: Copper Ck., VA; Clinch R, TN, VA: Powell R., TN, VA	Aquatic-rivers.	E	G2	S2	-
1	-	X	*Quadrula cylindrica strigillata*	Rough rabbits foot	Clinch R, Powell R, N Fk Holston R, Copper Ck	Aquatic-streams.	E	G3G4T2	S2	-
1	-	X	*Quadrula intermedia*	Cumberland monkeyface	Powell R	Aquatic-rivers.	E	G1	S1	-
1	-	X	*Quadrula sparsa*	Appalachian monkeyface	Clinch R, Powell R	Aquatic-rivers.	E	G1	S1	-
1	-	X	*Toxolasma lividum*	Purple lilliput	N Fk Holston R, Clinch R	Aquatic-rivers.	S	G3Q	SH	-
1	-	X	*Villosa perpurpurea*	Purple bean	Clinch R, Copper Ck	Aquatic-rivers.	E	G1	S1	-
1	-	X	*Villosa trabalis*	Cumberland bean	Clinch R	Aquatic-rivers.	E	G1	SX	-
Spider (Arachnid)										
6	-	X	*Microhexura montivaga*	Spruce-fir moss spider	Whitetop Mtn	Damp, well-drained moss and liverwort mats on boulders in mature spruce-fir forests.	E	G1	S1	-
Amphipod (Crustacean, Order Amphipoda)										
1	-	X	*Stygobromus abditus*	James Cave amphipod	James, Sam Bells caves, Pulaski Co; Watsons cave, Wythe Co; and other New River caves.	Aquatic-caves, water well.	S	G3	S3	-
1	-	X	*Stygobromus emarginatus*	Greenbrier Cave amphipod	Greenbrier, Monroe Cos, WV	Aquatic-caves. In caves under gravel in streambeds, occasionally in pools. Most abundant in smallest trickles of water. Primarily in tiny first and second order headwater cave streams.	S	G3	-	S3
1	X	-	*Stygobromus gracilipes*	Shenandoah Valley cave amphipod	Frederick, Rockingham, Shenandoah, Warren Cos	Aquatic-caves.	S	G3G4	S3	S1
1	X	-	*Stygobromus hoffmani*	Alleghany County cave amphipod	Low Moor cave, Alleghany Co	Aquatic-caves, groundwater habitats including springs and seeps.	S	G2	S2	-
1	X	-	*Stygobromus mundus*	Bath County cave amphipod	Alleghany, Bath Cos	Aquatic-caves.	S	G2G3	S1S2	-
1	-	X	*Stygobromus pollostus*	Least Cave stygobromid	Greenbrier, Monroe Cos, WV	Aquatic-caves.	S	G2G3	-	S3
1	-	X	*Stygobromus spinatus*	Spiny Cave stygobromid	Southern Monroe Co, north-northeast to central Pocahontas, Co, WV, primarily within the Greenbrier Valley. Covers a linear distance of ~67 miles.	Aquatic-caves. In gravels of small streams and in small cave pools.	S	G2G3	-	S2
Isopod (Crustacean, Order Isopoda)										
1	X	-	*Antrolana lira*	Madison Cave Isopod	Documented population centers in Waynesboro-Grottoes area, Augusta Co; Harrisonburg area Rockingham Co; valley of main stem of Shenandoah R, Warren, Cos,VA: Jefferson Co, WV. Not known from GWNF.	Aquatic-subterranean obligate in caves and karst groundwater.	T	G2G4	S2	S1
2	-	X	*Caecidotea incurva*	Incurved cave isopod	McCullin Cave, Smyth Co; Groseclose Cave No. 1, Wythe Co	Aquatic-caves.	S	G2G4	S2	-

OAR	GW	J	Species Name	Common Name	Range on or near GWJNFs	Habitat - Detail	TES	GRank	VA SRank	WV SRank
1	X	X	*Miktoniscus racovitzai*	Racovitza's terrestrial cave isopod	Alleghany, Botetourt, Page, Rockbridge, Shenandoah Cos	Aquatic-caves.	S	G3G4	S2	-
Crayfish (Crustacean, Order Decapoda)										
1	-	X	*Cambarus callainus*	Big Sandy crayfish	In VA, Upper Russell Fk drainage Big Sandy R	Aquatic-streams. Fast flowing streams of moderate width. Formerly: *Cambarus veteranus*.	T	G2	S1S2	S1
Centipede (Insect, Order Chilopoda)										
6	X	X	*Escaryus cryptorobius*	Montane centipede	The Priest, Nelson Co; Whitetop Mtn, near junction of Grayson, Washington, Smyth Co	Upper soil horizon, spruce-birch forests.	S	G2	S2	-
6	-	X	*Escaryus orestes*	Whitetop Mountain centipede	Whitetop Mtn, near junction of Grayson, Washington, Smyth Co	Dark moist soil and litter, spruce-birch forests.	S	G1G2	S1S2	-
Springtail (Insect, Order Collembola)										
1	X	-	*Pygmarrhopalites sacer*	A cave springtail	Bath Co	Caves.	S	G2	S2	-
Dragonfly (Insect, Order Odonata)										
1	X	X	*Gomphus viridifrons*	Green-faced clubtail	New R, Craig Ck, Pound R, Locust Spring	Aquatic-rivers.	S	G3G4	S2	S2
1	-	X	*Ophiogomphus howei*	Pygmy snaketail	Upper New R; Carroll, Grayson, Wythe Cos	Aquatic-rivers.	S	G3	S1S2	-
Stonefly (Insect, Order Plecoptera)										
4	-	X	*Allocapnia fumosa*	Smokies snowfly	High elevation rheocrenes (flowing springs) of Mt. Rogers. Grayson, Smyth Cos.	Aquatic-streams.	S	G2	S1S2	
4	-	X	*Megaleuctra williamsae*	Smokies needlefly	Mt Rogers & Whitetop Mtn	Aquatic-streams.	S	G2	S1S2	-
1	-	X	*Taeniopteryx nelsoni*	Cryptic willowfly	Lewis Fk & Grindstone Branch N of Mt Rogers	Aquatic-streams.	S	G1	S1	-
Beetle (Insect, Order Coleoptera)										
2	X	X	*Cicindela patruela*	Northern barrens tiger beetle	Blue Ridge, Ridge & Valley	Eroded slopes of exposed sandstone and conglomerate.	S	G3	S2	S2S3
1	-	-	*Pseudanophthalmus avernus*	Avernus Cave beetle	Endemic to Endless Caverns (commercial cave, non-FS) Rockingham Co.	Caves.	S	G1	S1	-
1	-	X	**Pseudanophthalmus cordicollis**	Little Kennedy Cave beetle	Franklins Pit, Little Kennedy Cave, Omega Cave System, Wildcat Saltpetre Cave, Wise Co., VA	Caves.	S	G1	S1	-
1	X	-	*Pseudanophthalmus intersectus*	Crossroads Cave beetle	Known only from Crossroads Cave, Millboro Springs, Bath Co.	Caves.	S	G1G2	S1	-
Scorpionfly (Insect, Order Mecoptera)										
4	-	X	*Brachypanorpa jeffersoni*	Jefferson's short-nosed scorpionfly	Sugar Run Mountain, Giles Co; Whitetop Mtn, Smyth Co.	Moist soil around seeps. Only known from high elevation. Larvae use short burrows in loose soil and moss.	S	G2	S1S2	-
Butterfly, Skipper, Moth (Insect, Order Lepidoptera)										
1	-	X	*Atrytone arogos*	Arogos skipper	Historic records, Blacksburg area. Caldwell Fields records need to be verified.	Relatively undisturbed grasslands, prairies, sand prairies, serpentine barrens, grassland/herbaceous, old field. Larval host plant; big bluestem *Andropogon gerardi.*	S	G3	SH	-
1	X	X	*Calephelis borealis*	Northern metalmark	Alleghany, Augusta, Bath, Botetourt, Craig, Lee, Montgomery, Russell, Scott Cos: Historic records from Giles, Rockbridge Cos.	Openings within forested or wooded areas, natural outcrops, shale or limestone barrens, glades or powerline right of ways. Larvae host plant; round-leaf ragwort, *Senecio obovatus*.	S	G3G4	S2S3	S2
1	X	X	*Callophrys irus*	Frosted elfin	Frederick, Montgomery, Page, Roanoke Cos.	Dry, open woods, clearings, and road/powerline ROWs with abundant wild indigo, *Baptisia tinctoria*.	S	G3	S2?	S1
6	X	X	*Danaus plexippus*	Monarch	Blue Ridge, Ridge & Valley	Mixed hardwood/conifer forest; shrubland; grassland/herbaceous; old field; suburban/orchard; cropland/hedgerow. Larval host plant; milkweeds *Asclepias* spp.	S	G4	S4	S4
4	X	X	*Speyeria idalia*	Regal fritillary	Blue Ridge, Ridge & Valley	Riparian, grasslands-shrublands. Larval host plant, violets, *Viola* spp.	S	G3	S1	S1
1	X	X	*Erora laeta*	Early hairstreak	Bedford, Botetourt, Page, Rockbridge, Warren, Wise Cos., VA; Monroe, Pendleton Cos., WV. Historic records from Giles, Montgomery Cos.	Hardwood forests or hardwood-northern conifer mixed forests. Larval host food, young fruit of American beech, *Fagus grandifolia*, nuts of beaked hazelnut *Corylus cornuta.* Canopy dweller.	S	GU	S2	S2
1	X	X	*Erynnis martialis*	Mottled duskywing	Historic records from Augusta, Bedford, Botetourt, Craig, Montgomery, Rockbridge Cos.; St. Mary's R near entrance to Wilderness Area, Augusta Co.	Open woodland; barrens; open brushy fields. Larval host plant; New Jersey tea *Ceanothus americanus*.	S	G3	S1S3	S3
4	X	X	*Erynnis persius persius*	Persius duskywing	Blue Ridge, Ridge & Valley	Bogs, wet meadows, open seepages in boreal forests. Larval host plant; lupine, *Lupinus perennis*, wild indigo, *Baptisia tinctoria*.	S	G5T1T3	S1	-
1	X	-	*Pyrgus centaureae wyandot*	Appalachian grizzled skipper	Ridge & Valley	Shale barrens, open shaley oak woodlands. Larval host plant; cinquefoil, *Potentilla* spp, strawberry, *Fragaria virginina.*	S	G5T1T2	S1	S1
1	X	X	*Catocala herodias gerhardi*	Herodias underwing	Bald Knob, Bath Co; Poverty Hollow, Montgomery Co; Sand Mtn, Wythe Co (non FS property)	Pitch pine/bear oak scrub woodlands, >3000'. Larval host plant; oak, *Quercus* spp.	S	G3T3	S2S3	SU
1	-	X	*Catocala marmorata*	Marbled underwing	Montgomery Co	Mesic montane hardwood forests; Forested wetland, riparian. Larval host plants; willows/cottonwoods, *Salix/Populus*.	S	G3G4	S2	-
1	X	-	*Euchlaena milnei*	Milne's euchlaena moth	Warm Springs Mtn, Catawba Creek Slopes, Sweet Spring Hollow, Salt Pond Mtn. (Doe Creek)	Moist, forested slopes of mixed pine hardwoods. Acidic oak woods.	S	G2G4	S2	S2
Bee (Insect, Order Hymenoptera)										

OAR	GW	J	Species Name	Common Name	Range on or near GWJNFs	Habitat - Detail	TES	GRank	VA SRank	WV SRank
10	X	X	*Bombus affinis*	Rusty-patched bumble bee	Bath Co, VA: new location on Warm Springs RD, Duncan Knob found 6/2017. Following VA/WV county occurrences historic (Alleghany, Carroll, Frederick, Giles, Grayson, Montgomery, Nelson, Page, Pulaski, Rockbridge, Rockingham, Wythe Cos., VA; Hardy, Hampshire, Monroe, Pendleton, Pocahontas Cos, WV).	Habitat generalist: grasslands, old field, mature woods, open woodlands, mixed farmland edges, marshes, urban areas. Feeds from a variety of plants for pollen and nectar, including flowering rhododendron and mountain laurel. Nest sites include abandoned rodent burrows, fallen dead wood, stumps. Queen only overwinters.	E	G1	SH	-
NON-VASCULAR PLANT										
Lichen										
6	-	X	*Alectoria fallacina*	Witch's-hair lichen	Smyth, Grayson Co	S. Appalachian endemic. Conifer trees, especially fir rarely on birch, in spruce-fir forests; rarely fire cherry communities.	S	G2	SH	SNR
6	-	X	*Gymnoderma lineare*	Rock gnome lichen	Whitetop Mtn	Spruce-fir forests.	E	G2	S1	-
6	X	X	**Heterodermia appalachensis**	Appalachian shield lichen	St. Mary's Wilderness, Augusta Co.; Skidmore Fork, Rockingham Co.; Browns Run, Page Co.; rock outcrop, 6 mi. SE of Edinburg, Page Co.; summit of Whitetop Mt, Washington Co.	Bark of hardwoods, occasionally on shaded rocks.	S	G2?	S1	-
6	-	X	*Heterodermia erecta*	A foliose lichen	Along Whitetop access road, 1.2 mile from summit, Grayson Co., VA.	S. Appalachian endemic.	S	G1?	S1	-
6	-	X	*Hypotrachyna oostingii*	A foliose lichen	Mount Rogers, on Smyth, Grayson Co. line	Spruce-fir forests.	S	G2?	SU	-
6	-	X	*Hypotrachyna virginica*	Virginia hypotrachyna lichen	Mt Rogers & Whitetop Mtn	Spruce-fir forests. Found on spruce, fir, rhododendron in spruce-fir and fire-cherry communities in S. Appalachian Mtns. Typically at higher elevations, has been found at lower elevations.	S	G1G2	S1	SNR
6	-	X	*Lecanora masana*	A lichen	Whitetop Mtn, and Grayson, Smyth Cos	S. Appalachian endemic. Spruce-fir, northern hardwood-conifer forest.	S			
1	X	-	*Melanelia culbersonii*	Culberson's Black-parmelia	Massanutten (Fridley watershed) Rockingham Co; along trail from Wolf Gap Campground to Big Schloss, Shenandoah Co.	Rocks in open areas and on talus slopes. Fully exposed, minimally weathered quartzite and sandstone boulderfields at elevations from about 1000-3300 ft.	S	G2	S4	-
Liverwort										
6	-	X	*Bazzania nudicaulis*	A liverwort	Mt Rogers & Whitetop Mtn	Bark and rock outcrops in spruce-fir forests.	S	G2G3	S?	-
1	X	-	*Cephaloziella spinicaulis*	A liverwort	Along SR 33, 10 miles W of Harrisonburg.	Damp soil in crevices of shaded sedimentary rocks, in hemlock-hardwoods forest and humid to dry faces of ledges and cliffs in open oak-hickory forest.	S	G3G4	SNR	-
1	-	X	*Leptoscyphus cuneifolius*	Wedge Flapwort	Grayson Co	Bark of Fraser fir.	S	G4G5	SH	-
1	-	X	*Nardia lescurii*	A liverwort	Blue Ridge, Ridge & Valley	Riparian - on peaty soil over rocks, usually in shade and associated with water, <3000'.	S	G3?	S1	-
1	-	X	*Plagiochila austinii*	A liverwort	Little Stony Ck – Cascades; Red Ck on Beartown Mtn	Rich, moist, densely forested ravines; shaded outcrops.	S	G3	S?	-
6	-	X	*Plagiochila corniculata*	A liverwort	Grayson, Smyth Cos	Limited to densely shaded, humid, often fog-enshrouded mountain summits, usually to the spruce-fir association. Most commonly found on Fraser fir.	S	G4?	SNR	-
6	-	X	*Plagiochila sullivantii var. sullivantii*	A liverwort	Whitetop Mtn, Salt Pond Mtn	Moist shaded rock outcrops, under cliff ledges, in crevices.	S	G2T2	SNR	-
1	X	X	*Plagiochila virginica*	A liverwort	Bath, Giles, Highland, Roanoke Cos	S. Appalachian endemic. Damp to intermittently dry calcareous or sandstone ledges or cliffs in partially exposed sites.	S	G3	SNR	SNR
6	X	X	*Radula tenax*	A liverwort	Alleghany, Amherst, Dickenson, Giles, Highland, Nelson, Smyth, Washington Cos	Moist rocks or trees in mountains below spruce-fir zone; Depressed, dense mats on moist rocks, less frequently on tree trunks, in mountainous and hilly regions. Two discrete modes of occurrence: on shaded, damp rocks, and on tree bark in deep, moist forests. Does not tolerate submersion.	S	G3G4	SU	SNR
6	-	X	*Sphenolobopsis pearsonii*	A liverwort	Mt Rogers & Whitetop Mtn	Bark of Fraser fir, mountain ash, occasionally on red spruce, >5000'.	S	G2	S?	-
Moss										
6	-	X	*Sphagnum flavicomans*	Northeastern peatmoss	Whitetop Mtn	Bogs, seeps.	S	G3	SU	-
VASCULAR PLANT										
6	-	X	*Abies fraseri*	Fraser fir	Grayson, Smyth Cos	S. Appalachian endemic. Spruce–fir forests, bogs >5000'	S	G2	S1	SNR
1	X	X	*Aconitum reclinatum*	Trailing white monkshood	Blue Ridge, Ridge & Valley	Rich cove sites, streambanks, seepages; all with high pH.	S	G3	S3	S3
1	-	X	*Actaea rubifolia*	Appalachian black cohosh	Lower Clinch R watershed, Scott, Wise Cos	Moist, rich wooded bluffs over limestone.	S	G3	S1	-
1	X	X	*Allium oxyphilum*	Nodding onion	Monroe, Summers, Mercer, Greenbrier Cos, WV	Shale barrens, sandstone glades.	S	G2	S1	S2
1	X	-	*Arabis patens*	Spreading rockcress	Frederick, Lee, Page, Shenandoah, Warren Cos, VA; Hampshire, Hardy, Pendleton Cos, WV	Shaded, calcareous cliffs, bluffs, and talus slopes.	S	G3	S1	S2
1	X	X	*Berberis canadensis*	American barberry	Blue Ridge, Ridge & Valley	Calcareous open woods, bluffs, cliffs, and along fencerows.	S	G3	S3S4	S1
1	-	X	*Betula uber*	Virginia round-leaf birch	One location: Cressy Ck, Smyth Co.	Riparian, mixed open forest, usually disturbed sites.	T	G1Q	S1	-
1	X	-	*Boechera serotina*	Shale barren rockcress	Ridge & Valley N of James R watershed	Shale barrens and adjacent open oak woods.	E	G2	S2	S2

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1	X	-	*Boltonia montana*	Mountain doll's-daisy	Augusta Co	Sinkhole ponds.	S	G1G2	S1	-
1	-	X	*Botrychium jenmanii*	Alabama Grapefern	Russell & Wise Cos.	Open woods, old fields, pastures. Formerly: *Sceptridium jenmanii*	S	G3G4	SH	-
2	X	X	*Buckleya distichophylla*	Piratebush	Blue Ridge S of Roanoke R, Ridge & Valley S of James R	Open oak and hemlock woods.	S	G3	S2	-
6	-	X	*Cardamine clematitis*	Mountain bittercress	Blue Ridge, Ridge & Valley, S of New R watershed	Riparian, spring seeps, rocky streamsides.	S	G3	S1	-
1	X	X	*Carex polymorpha*	Variable sedge	Blue Ridge, Ridge & Valley, N of James R	Open acid soil, oak-heath woodlands, responds positively to fire.	S	G3	S2	S1
1	X	X	*Carex schweinitzii*	Schweinitz's sedge	Augusta, Bath, Highland, Montgomery, Pulaski, Washington Cos	Bogs, limestone fens, marl marshes.	S	G3G4	S1	-
2	-	X	*Chelone cuthbertii*	Cuthbert turtlehead	Blue Ridge Plateau, Grayson, Carroll Cos	Bogs, wet meadows, boggy woods and thickets.	S	G3	S2	-
1	-	X	*Cleistesiopsis bifaria*	Small spreading pogonia	Craig, Dickenson, Scott, Wise Cos	Well drained, rather open, scrubby hillsides, oak-pine-heath woodlands, acidic soils.	S	G4?	S2	S1
1	-	X	*Clematis addisonii*	Addison's leatherflower	Montgomery, Roanoke, Botetourt, Rockbridge Cos	Open glades & rich woods over limestone and dolostone.	S	G1?	S2	-
1	X	X	*Clematis coactilis*	Virginia white-haired leatherflower	Ridge & Valley, Rockbridge Co, S to Wythe Co	Shale barrens, rocky calcareous woodlands.	S	G3	S3	-
1	X	-	*Clematis viticaulis*	Millboro leatherflower	Endemic to VA, only in Bath, Rockbridge Cos.	Shale barrens, open shaly woodlands.	S	G1	S1	-
1	X	X	*Corallorhiza bentleyi*	Bentley's coralroot	Alleghany, Bath, Giles Cos VA; Monroe, Pocahontas Cos WV	Dry, acid woods, along roadsides, well-shaded trails.	S	G2	S2	S1
2	X	X	*Delphinium exaltatum*	Tall larkspur	Blue Ridge, Ridge & Valley	Dry calcareous soil in open grassy glades or thin woodlands.	S	G3	S3	S2
1	X	-	*Echinodorus tenellus*	Dwarf burhead	Pines Chapel Pond, Augusta Co	Pond margins, wet depressions in sandy soil.	S	G5?	S1	-
1	X	X	*Echinacea laevigata*	Smooth coneflower	Alleghany, Montgomery Cos	Open woodlands and glades over limestone or dolomite.	E	G2G3	S2	-
2	X	X	*Euphorbia purpurea*	Glade spurge	Blue Ridge, Ridge & Valley	Rich, swampy woods, seeps and thickets.	S	G3	S2	S2
1	X	X	*Gaylussacia brachycera*	Box huckleberry	Alleghany, Bath, Bland, Carroll, Craig, Dickenson, Montgomery Cos	Dry, acidic forests, woodlands of oaks, pines, and other heaths.	S	G3	S1	S2
1	X	X	*Gymnocarpium appalachianum*	Appalachian oak fern	Alleghany, Augusta, Bath, Highland, Page, Rockbridge, Rockingham, Warren Cos	Maple-birch-hemlock woods on mountain slopes and summits, moist sandstone, talus slopes, or bouldery colluvium. Requires cool, moist microclimate, typically on north-facing slopes with cold air seepage >2000'.	S	G3	S3	S1
1	X	-	*Helenium virginicum*	Virginia sneezeweed	Endemic to Augusta, Rockingham Cos.	Seasonally dry meadows and sinkhole depressions.	T	G3	S2	-
1	X	-	*Helonias bullata*	Swamp-pink	Augusta, Nelson Cos	Sphagnum bogs, seeps, and streamsides.	T	G3	S2S3	-
1	X	-	*Heuchera alba*	White alumroot	Shenandoah Mtn	High elevation rocky woods and bluffs.	S	G2Q	S1	S2
1	X	X	*Ilex collina*	Long-stalked holly	Blue Ridge, Ridge & Valley	Bogs, seep, shrubby streamheads, >3100'.	S	G3	S1	S2
1	-	X	*Iliamna corei*	Peter's Mountain-mallow	One location: Narrows, Peters Mountain, Giles Co.	Rich, open woods along sandstone outcrops, soil pockets, fire maintained.	E	G1	S1	-
1	X	X	*Isotria medeoloides*	Small whorled pogonia	In mountains of VA known only from Bedford, Craig, and Lee Cos; other VA occurrences in Piedmont & Coastal Plain.	Open, mixed hardwood forests on level to gently sloping terrain with north to east aspect.	T	G2?	S2	S1
2	X	X	*Juglans cinerea*	Butternut	Blue Ridge, Ridge & Valley	Well-drained bottomland and floodplain, rich mesophytic forests, mostly along toeslopes.	S	G4	S3?	S3
2	X	X	*Liatris helleri*	Turgid gayfeather	Blue Ridge, Ridge & Valley	Shale barrens, mountain hillside openings. *L.turgida* synonymous with *L. helleri*.	S	GNR	S3	S2
4	-	X	*Lilium grayi*	Gray's lily	Blue Ridge, Mt Rogers & Whitetop Mtn (occurrences north of Floyd Co questionable).	Bogs, open seeps, wet meadows, grassy balds.	S	G3	S2	-
1	X	X	*Monotropsis odorata*	Sweet pinesap	Blue Ridge, Ridge & Valley	Dry oak-pine-heath woodlands, soil usually sandy.	S	G3	S3	S1
1	-	X	*Packera millefolium*	Piedmont ragwort	Lee, Scott Cos	Open limestone outcrops and cedar barrens.	S	G2	S2	-
6	X	X	*Parnassia grandifolia*	Largeleaf grass-of-Parnassus	Augusta, Bland, Giles, Grayson, Lee, Montgomery, Russell, Washington, Wythe	Fens, thinly wooded, gravelly seeps over limestone, dolomite, amphibolite, and ultramafic rocks; restricted to calcareous or magnesium-rich soils.	S	G3	S1	-
1	X	-	*Paxistima canbyi*	Canby's mountain lover	Ridge & Valley, Sarver Barrens SBA, Craig Co	Calcareous cliffs and bluffs, usually undercut by stream.	S	G2	S2	S2
1	X	X	*Phemeranthus teretifolius*	Quill fameflower	Amherst, Augusta (west side of Blue Ridge, near Laurel Springs Gap, Humpback Mtn SBA), Bedford, Carrol, Craig (Bald Mtn SBA), Grayson, Montgomery, Nelson, Page, Roanoke, Rockingham, Warren Cos, VA; Hardy & Hampshire Cos, WV	Calcareous sandstone glades, metabasalt barrens. Also *Talinum teretifolium* (Roundleaf fameflower)	S	G4	S4	S1
1	X	X	*Phlox buckleyi*	Sword-leaf phlox	Blue Ridge, Ridge & Valley	Open, often dry oak woodlands and rocky slopes, usually over shale in humus rich soils, often along roadsides.	S	G2	S2	S2
	X	X	*Poa paludigena*	Bog bluegrass	Blue Ridge, Ridge & Valley	Shrub swamps and seeps, usually under shade.	S	G3	S2	S1
1	X	-	*Potamogeton hillii*	Hill's pondweed	Bath Co	Clear, cold calcareous ponds.	S	G3	S1	-
2	X	-	*Potamogeton tennesseensis*	Tennessee pondweed	Ridge & Valley	Ponds, back water of streams and rivers.	S	G2G3	S1	S2
1	X	X	*Pycnanthemum torrei*	Torrey's mountain-mint	Bland, Bath, Giles, Rockbridge, Wythe Cos	Open, dry rocky woods, roadsides, and thickets near streams, heavy clay soil over calcareous rock.	S	G2	S2	S1
2	X	X	*Scirpus ancistrochaetus*	Northeastern bulrush	Ridge & Valley	Mountain ponds, sinkhole ponds in Shenandoah Valley.	E	G3	S2	S1
2	X	X	*Scutellaria saxatilis*	Rock skullcap	Blue Ridge, Ridge & Valley	Rich, dry to mesic ridgetop woods, 32 counties in VA, likely G4/S4.	S	G3	S3	S2

OAR	GW	J	Species Name	Common Name	Range on or near GWJNFs	Habitat - Detail	TES	GRank	VA SRank	WV SRank
1	-	X	*Silene ovata*	Mountain catchfly	Dickenson, Lee, Wise Cos	Rich woodlands and forests over limestone.	S	G3	S1	-
2	-	X	*Spiraea virginiana*	Virginia spiraea	Blue Ridge, Ridge & Valley, S of New R	Scoured banks of streams, riverside or island shrub thickets.	T	G2	S1	S1
1	X	X	*Thermopsis mollis*	Soft-haired thermopsis	Amherst, Bath, Bedford, Botetourt, Montgomery, Rockbridge Cos	Dry, open forests, woodlands, and clearings.	S	G3G4	S3	-
1	X	X	*Trifolium virginicum*	Kate's Mountain clover	Alleghany, Augusta, Bath, Botetourt, Craig, Frederick, Highland, Rockbridge, Rockingham, Shenandoah, Warren Cos	Shale barrens.	S	G3	S3	S3
1	-	X	*Tsuga caroliniana*	Carolina hemlock	Blue Ridge north to James R.	Rocky ridges and slopes, usually dry and well drained.	S	G3	S3	-
2	X	X	*Vitis rupestris*	Sand grape	Ridge & Valley	Scoured banks of rivers and streams over calcareous bedrock.	S	G3	S1	S2

LEGEND FOR TES SPECIES LIST IN OCCURRENCE ANALYSIS RESULTS:

OAR CODES:

1 = Project located out of known species range.
2 = Lack of suitable habitat for species in project area.
3 = Habitat present, species was searched for during field survey, but not found.
4 = Species occurs in project area, but outside of activity area.
5 = Field survey located species in activity area.
6 = Species not seen during field survey, but possibly occurs in activity area based on habitat observed; or field survey not conducted when species is recognizable (time of year or time of day). Therefore assume presence and no additional surveys needed.
7 = Aquatic species or habitat known or suspected downstream of project/activity area, but outside identified geographic bounds of water resource cumulative effects analysis area (defined as point below which sediment amounts are immeasurable and insignificant).
8 = Aquatic species or habitat known or suspected downstream of project/activity area, but inside identified geographic bounds of water resource cumulative effects analysis area.
9 = Project occurs in a 6th level watershed included in the USFWS/FS T&E Mussel and Fish Conservation Plan (August 8, 2007 U.S. Fish & Wildlife Service concurrence on updated watersheds). Conservation measures from the USFWS/FS T&E Mussel and Fish Conservation Plan applied.
10 = Historic records for this species only; or no known records on GWJ; or species considered extirpated from Virginia/West Virginia.

SPECIES: The term "species" includes any subspecies of fish, wildlife or plants, and any distinct population segment of any species or vertebrate fish or wildlife, which interbreeds when mature (Endangered Species Act of 1973, as amended through the 100th Congress).

RANGE: The geographical distribution of a species. For use here "range" is expressed as where a species is known or expected to occur on or near the George Washington and Jefferson National Forests in terms of landform (feature name, physiographic province), political boundary (county name), or watershed (river, or stream name).

HABITAT: A place where the physical and biological elements of ecosystems provide a suitable environment and the food, cover and space resources needed for plant and animal livelihood (FSM 2605-91-8, pg. 10 of 13).

TES CODES:

T = Federally listed as Threatened
E = Federally listed as Endangered
P = Federally Proposed as T or E
S = Southern Region (R8) Sensitive species

GLOBAL RANK: Global ranks are assigned by a consensus of the network of natural heritage programs, scientific experts, NatureServe and The Nature Conservancy to designate a rarity rank based on the range-wide status of a species or variety. This system was developed by The Nature Conservancy and is widely used by other agencies and organizations as the best available scientific and objective assessment of taxon rarity and level of threat to its

existence. The ranks are assigned after considering a suite of factors including number of occurrences, numbers of individuals, and severity of threats.

G1 = Extremely rare and critically imperiled with 5 or fewer occurrences or very few remaining individuals; or because of some factor(s) making it especially vulnerable to extinction.
G2 = Very rare and imperiled with 6 to 20 occurrences or few remaining individuals; or because of some factor(s) making it especially vulnerable to extinction.
G3 = Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range; or vulnerable to extinction because of other factors. Usually fewer than 100 occurrences are documented.
G4 = Common and apparently secure globally, although it may be rare in parts of its range, especially at the periphery.
G5 = Very common and demonstrably secure globally, although it may be rare in parts of its range, especially at the periphery.
GH = Formally part of the world's biota with the exception that may be rediscovered.
GX = Believed extinct throughout its range with virtually no likelihood of rediscovery.
GU = Possibly rare, but status uncertain and more data needed.
G? = Unranked, or, if following a ranking, ranking uncertain (ex. G3?).
G_Q = Taxon has a questionable taxonomic assignment, such as G3Q.
G_T = Signifies the rank of a subspecies or variety. For example, a G5T1 would apply to a subspecies of a species that is demonstrably secure globally (G5) but the subspecies warrants a rank of T1, critically imperiled.

STATE RANK: The following ranks are used by the Virginia Department of Conservation and Recreation to set protection priorities for natural heritage resources. Natural Heritage Resources (NHRs) are rare plant and animal species, rare and exemplary natural communities, and significant geologic features. The criterion for ranking NHRs is the number of populations or occurrences, i.e. the number of known distinct localities; the number of individuals in existence at each locality or, if a highly mobile organism (e.g., sea turtles, many birds, and butterflies), the total number of individuals; the quality of the occurrences, the number of protected occurrences; and threats.

- **S1** - Extremely rare; usually 5 or fewer populations or occurrences in the state; or may be a few remaining individuals; often especially vulnerable to extirpation.
- **S2** - Very rare; usually between 6 and 20 populations or occurrences; or with many individuals in fewer occurrences; often susceptible to becoming extirpated.
- **S3** - Rare to uncommon; usually between 21 and 100 populations or occurrences; may have fewer occurrences, but with a large number of individuals in some populations; may be susceptible to large-scale disturbances.
- **S4** - Common; usually >100 populations or occurrences, but may be fewer with many large populations; may be restricted to only a portion of the state; usually not susceptible to immediate threats.
- **S5** - Very common; demonstrably secure under present conditions.
- **SA** - Accidental in the state.
- **S#B** - Breeding status of an organism within the state.
- **SH** - Historically known from the state, but not verified for an extended period, usually > 15 years; this rank is used primarily when inventory has been attempted recently.
- **S#N** - Non-breeding status within the state. Usually applied to winter resident species.
- **SR** – Reported for Virginia, but without persuasive documentation that would provide a basis for either accepting or rejecting the report.
- **SU** - Status uncertain, often because of low search effort or cryptic nature of the element.
- **SX** - Apparently extirpated from the state.
- **SZ** - Long distance migrant, whose occurrences during migration are too irregular, transitory and/or dispersed to be reliably identified, mapped and protected.
- **NA** – Not Applicable- A conservation status rank in not applicable because the species is not a suitable target for conservation activities.

These ranks should not be interpreted as legal designations.